

Hypersonic Reusable Technologies for Access to Space

Completed Technology Project (2012 - 2016)



Project Introduction

The central objective of the proposal is to implement a robust multi-physics optimization on a hypersonic space-plane concept. Optimization evaluates changes to the parameters of a design to achieve better performance. A robust optimization produces a design which is not very sensitive to uncertainties, such as uncertainties in the conditions of flight or in model accuracy. Multi-physics simulation uses multiple physical models together to better simulate complex and coupled systems. The hypersonic regime is defined not as a specific Mach number, but rather as the flight regime where a number of physical phenomena become more important. It is an extreme temperature environment where the physical characteristics of the air change as the gas becomes ionized, and the assumptions used in other flow regimes break down. Real gas effects and nonlinear aspects of the governing equations become important. The project that I have described could be considered under several of the Technology Area Breakdown sections. Due to the methods used, it is related to section 11.3.3, Simulation Based Systems Engineering. Ramjet/scramjet engines (1.3.5) are fundamental to hypersonic design as air-breathing hypersonic vehicles are designed around their propulsion systems. The overall objective of my education program will be to implement a robust multi-physics optimization on a hypersonic space-plane concept. The Reusable Airbreathing Launch Vehicles program, which is in NASAs Hypersonics program under Fundamental Aeronautics, will also be supported by this project.

Anticipated Benefits

Ramjet/scramjet engines (1.3.5) are fundamental to hypersonic design as air-breathing hypersonic vehicles are designed around their propulsion systems. The overall objective of my education program will be to implement a robust multi-physics optimization on a hypersonic space-plane concept. The Reusable Airbreathing Launch Vehicles program, which is in NASAs Hypersonics program under Fundamental Aeronautics, will also be supported by this project.



Project Image Hypersonic Reusable Technologies for Access to Space

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

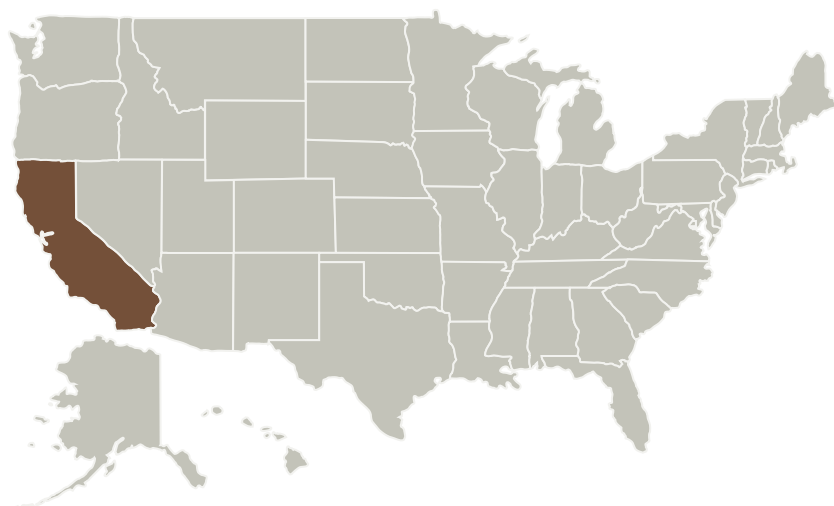
Space Technology Research Grants

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Primary U.S. Work Locations and Key Partners



Primary U.S. Work Locations

California

Images



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Project Image Hypersonic Reusable Technologies for Access to Space
(<https://techport.nasa.gov/image/1776>)

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

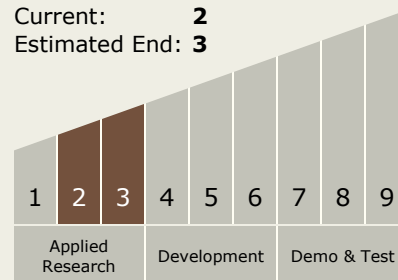
Juan J Alonso

Co-Investigator:

Heather Kline

Technology Maturity (TRL)

Start: 2
Current: 2
Estimated End: 3



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.3 Aero Propulsion
 - TX01.3.6 Ramjet/Scramjet

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Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>